supply and sanitation programs. Primary health care activities may be centrally coordinated but they are locally controlled. Action takes place at the village level, the chief functionaries remain and work in the community, are responsible to it and preferably have been brought up there. Thus a source of education and information is always available to the village. Any technology introduced as part of the primary health care program can be maintained and is regarded as belonging to the community it serves.

Primary health care programs have been shown capable of reaching the village with basic environmental improvements. Unfortunately relatively few countries have thus far benefitted in this way. In other areas many low-cost health services projects are operating on a small scale and will serve as models on which national health care programs will be based. Few are engaged in improving excreta disposal and water supply and facilities as a result of lack of technical expertise, and thus confidence, in this area.

We are, I believe, at the beginning of a rapid expansion of rural health care programs. If they truly are, as they purport to be, "preventative" in orientation, then technical expertise in water and sanitation will have to be integrated into their activities and training programs. Conversely, if the poorest and remoter villagers are going to benefit from the coming surge of emphasis on water, we will have to look to the emerging primary health care programs as the most important mechanism of implementation.

If we are to speak of the importance of water supply, proper excreta disposal and hygiene, improvements to health and the need to implement such activities in rural areas of developing countries, they must be viewed together as components of a "sanitation package". If each component is left to be implemented separately, the potential health benefits are seriously constrained, if not totally lost.

The question is not how many water supplies can be installed over a given period of time, but why and how they are implemented, to what effect, and most important of all, at what opportunity costs? □

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WANTED: a better hand pump

David Henry

Any water supply system is only as good as its weakest component — and in rural areas of the Third World the weakest component is usually the pump. The reasons are simple: most hand pumps were designed long ago and far away for use in a completely different environment.

Over the past 100 years or so the basic design of the hand pump has remained virtually unchanged. What is badly needed is a better machine, and a group of scientists at the University of Waterloo, Canada, are hoping they may have it. With the support of an IDRC grant, the team at Waterloo — composed of senior members of the engineering faculty with backgrounds in physics, fluidics and chemical engineering — has been working on the problem since the beginning of the year. Their objective: "to optimize the design of a piston and check valve configuration for use in low-cost rural water pumps."

What they hope to produce is a pump that is reliable, tough, inexpensive, requires no specialized maintenance, and can be adapted to local manufacture. The exercise has focussed primarily on the use of various plastics, as opposed to traditional materials such as bronze, brass, cast iron, and mild steel. Plastic injection moulding techniques could result in considerable savings in manufacturing costs, and many developing countries already have the basic injection moulding capacity to produce pump components.

Given these guidelines, the researchers developed and tested a number of different design configurations in the laboratory. These prototypes are capable of being adapted to high, medium and low lift, and will be manufactured in four sizes, from 1½ to 3 inches diameter. This flexibility will allow the pumps to meet the wide variations in factors such as aquifer characteristics and population distribution that will be encountered in actual use.

The prototypes with the best performance record under laboratory conditions have now been selected for extensive field testing and research. Discussions are currently underway with five countries already engaged in pump development with a view to organizing a two-year testing program that will feed back into the design exercise the actual field experience. In this way further modifications can be incorporated if necessary.

One of the major parts of the field research will be to develop more effective driving mechanisms using local materials. The most common cause for breakdown of the traditional cast-iron pump is the rapid wear and tear at bearing points. The developing country researchers will study various types of woods as an inexpensive and easily replaceable alternative material for bearings.

The decision to investigate the applicability of local woods for bearing was based in part on the effectiveness of wooden bearings in machines such as bullock carts. Such carts in India, for example, run on wooden bearings, and carry more freight each day than the Indian railways! The researchers also discovered that in fact the North American petrochemical industry imports African hardwoods for use in the manufacture of high-stress bearings.

All field research teams will use a uniform guide for conducting pumping tests that will enable easy comparison of results. Progress reports will be prepared periodically during the two-year testing period, and disseminated as widely as possible. The one major question still to be dealt with is the most effective method of getting the new pump into the marketplace once the optimal design has been determined. That is something that will have to be decided during the next two years, and any suggestions will be welcomed.

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